A Study on the Prevalence and Pattern of Refractive Errors among School Children of Medavakkam, Chennai

Jeevitha Jayapalan¹, Jothi Gopu², Sharmila Arcot Gunasekaran³, Hemima Josphina Herald⁴

¹Assistant Ophthalmic Surgeon, Department of Ophthalmology, Mugavari Eye Hospital, Medavakkam, Chennai.  
²Faculty, Department of Optometry, Mugavari Eye Hospital, Medavakkam, Chennai.  
³Optometry Student, Department of Ophthalmology, Mugavari Eye Hospital, Medavakkam, Chennai.  
⁴Optometry Student, Department of Ophthalmology, Mugavari Eye Hospital, Medavakkam, Chennai.

ABSTRACT

BACKGROUND
Refractive error is defined as the state of refraction wherein the parallel rays of light coming from infinity are focused either in front or behind the retina with the accommodation at rest. Refractive errors are one potential cause of visual impairment. So, it is important for our children to have visual examination at the right time. School eye health services, an integral part of National Program for Control of Blindness, serves as an important tool for screening children at school level. Screening is done by subjective and objective refraction. National program for control of blindness was initiated by Ministry of Health and Family Welfare in collaboration with district health authorities through public and NGO institutions. The objective of the study was to estimate the prevalence and pattern of refractive errors among the school going children in Medavakkam, Chennai, Tamilnadu.

METHODS
This cross sectional study was conducted in the government schools of Medavakkam during the period of June to November 2018. Total of 3727 students of age group 8-17 years were enrolled for screening in this study. Students were examined for defective vision with Snellen’s chart and pin hole in ambient room illumination. Children with defective vision underwent a comprehensive eye examination at Mugavari Eye Hospital and Research Institute, Medavakkam, Chennai.

RESULTS
Of the 3727 children on roll, 188 had refractive errors. Prevalence of refractive errors was found to be 5.04%. The proportion of myopia, hypermetropia and astigmatism were 74.48%, 17.02% and 8.5% respectively. Myopia was noted to be the most common refractive error followed by hypermetropia and astigmatism.

CONCLUSIONS
This study has provided the prevalence pattern of refractive errors of the study population. It concludes that Myopia is of high prevalence among the school going children. It also showed that children are at risk of developing refractive error and many of them were unaware of the same. Causes of prevalence and barriers to refractive error correction services are to be addressed earlier. Hence, an effective vision screening programme is needed to prevent visual impairment and blindness. In addition, children should be taught about principles of good posture, proper lighting to avoid glare, proper distance and angle between books and eyes.

KEYWORDS
Refractive Error, Prevalence, Visual Impairment, Myopia, School Children, School Health Services, Eye Screening
BACKGROUND

Vision or visual perception is a complex integration of light sense, form sense, contrast sense and colour sense. Visual acuity is a measure of form sense, so it refers to the spatial limit of visual discrimination. Emmetropia is an optically normal eye. Ametropia is a condition of refractive error. Ametropia includes Myopia, Hypermetropia and Astigmatism. Prevalence of ametropia among the general population was given by Stenstroms study. Refractive error is considered to be the second leading cause of correctable blindness and one among the causes of visual impairment around the world.

Visual impairment has a significant impact on children’s life. This in turn may lead to poor education, lower socioeconomic status, reduced employment opportunities and social stigmatization. Visual screening and diagnosis of refractive errors are especially important at certain times of life. The initial screening being in the first two decades, at the preschool and school years in a child who has failed vision screening. The second screening period being the mid-forties when presbyopia develops. The ideal place for initial visual screening would be the school setting, where the population, made up of children, can be targeted.

An ideal school eye health program should engage the department of health and education, be integrated in to the broad school health program and must be backed up by eye and child health services to manage referrals. The strategies to be used in the program includes education of the teachers and staff in primary eye care and vision screening, vision assessment with follow up system, engaging parent teacher meet up, involvement of other community based organisations and to understand factors associated with spectacle wear.

Children may not be aware of their defective vision. They may adjust to poor vision by sitting in the first row or sitting close to the black board, holding books close to their eyes, squeezing their eyes and even avoid their near work task to manage the visual discomfort. Myopia is of the commonest cause of correctable refractive error. Therefore, it is very important to slow or even stop the progression of myopia in children. In 95% of visually impaired children, the provision of spectacle improves their vision to within normal limits. An ideal spectacle should be non-allergic, resistant to corrosion, non-flammable, inexpensive, durable and adjustable. Also should be available locally and of a style that is acceptable to the child. These children also need follow up because refractive errors, especially myopia, tend to increase during the first two decades.

Various environmental factors related to socioeconomic status and lifestyle have been reported, and are widely considered to be possibly responsible for these changes. Refractive error in any population suggests that eye care services in general are inadequate. Strengthening and implementation of vision screening programs on large scale in those population will serve the need. A comprehensive approach in the treatment of refractive errors is to be followed.

The increasing demand of the enormous need for the correction of refractive error worldwide, has been considered as one of the priorities of global initiative for the prevention and elimination of treatable blindness: Vision 2020 - The Right to Sight. Vision 2020 will be implemented through the following activities; a) Specific disease control measures, b) Human resource development, c) Development of appropriate technology and infrastructure.

METHODS

This study was conducted in 6 government schools, including the primary, middle and high schools in and around Medavakkam, Kanchipuram district, Tamilnadu. Nearly 3727 students were screened for refractive error, during the period of June 2018 to November 2018. Among them 51.7% were boys and 48.3% were girls. A comprehensive eye examination was done for students with refractive error by the team of Mugavari Eye Hospital and Research institute, Medavakkam at their centre. The parameters studied were visual acuity by Snellen’s chart, anterior segment by slit lamp biomicroscopy, cycloplegic refraction by retinoscopy and fundus examination by ophthalmoscopy.

Inclusion Criteria
All school going children of age group 8-17 years were included.

Exclusion Criteria
Children with other ocular abnormalities such as congenital ocular malformation, strabismus, corneal abnormalities and retinal disorders were excluded from the study. The above population were referred to Mugavari Eye hospital, Medavakkam for further evaluation.

RESULTS

Of the study population, 188 children had refractive error (5.04%) (Chart 1). 67.5% of them were boys and 32.5%
were girls (table 1). All the children were screened with Snellen’s chart. The pattern of refractive error were myopia of 74.48%, hypermetropia of 17.02% and astigmatism of 8.5% (chart 2). The age wise prevalence of Myopia, Hyperopia and Astigmatism are shown in Table 2. It was found that Myopia had a high prevalence among the total refractive errors, followed by Hyperopia and Astigmatism. Our study showed the raise in the prevalence of refractive error as the children grows older as shown in Table 2. Our study also showed the prevalence of refractive error to be more in the male children 127 compared to female 61.

![Prevalence of Refractive Error](chart1)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Refractive Errors</th>
<th>Without Refractive Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>127 (67.5%)</td>
<td>1800</td>
</tr>
<tr>
<td>Female</td>
<td>61 (32.5%)</td>
<td>1739</td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>3539</td>
</tr>
</tbody>
</table>

**Table 1. Gender Distribution**

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Myopia</th>
<th>Hyperopia</th>
<th>Astigmatism</th>
<th>Prevalence of Refractive Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 to 17</td>
<td>97</td>
<td>11</td>
<td>09</td>
<td>117 (62.24%)</td>
</tr>
<tr>
<td>8 to 13</td>
<td>49</td>
<td>15</td>
<td>07</td>
<td>71 (37.76%)</td>
</tr>
</tbody>
</table>

**Table 2. Age Distribution**

**DISCUSSION**

This study showed the prevalence of refractive error to be 5.04% and the pattern to be myopia followed by hyperopia and astigmatism, among the school going children in Medavakkam, Kanchipuram district. Similar prevalence of refractive error (5.6%) was noted among the school children in Villupuram and Puducherry (Muthukrishnanan et al). Similar pattern of refractive errors were found in the study related to Ahmedabad city (Sonam Sethi et al). This study shows that the children among 14 -17 years of age are at increased risk of developing refractive error and of myopia more commonly and many of them were not aware of their visual status.

The number of people globally, with significant refractive errors has been estimated to be one to two billion. Rates vary between regions of the world with about 25% of Europeans and 80% of Asians affected. Near sightedness is one of the most prevalent disorders of the eye. Rates among children are between 1.2% to 42%.

Regarding the refractive error, changes occurs with ageing. A person is hyperopic in the early years of life and becomes myopic with the increase in age but again there is a hyperopic shift after forty years of age. Myopia tends to increase gradually until the mid to late teens.

The relationship between near work and myopia has been shown in different studies. In addition to the effect of near work, more children use electronic gadgets for their daily hobby time as a result of which, they are not engaged in outdoor activities. A recent clinical trial showed that the incidence of myopia was about 10% lower in children who were engaged in outdoor activities. Few studies have shown the role of intense light in the prevention of myopia formation. The mechanism is that light stimulates the secretion of dopamine in the retina which in turn prevents ocular elongation during the process of ocular development and prevents myopia.

In addition, the shared genes between the parents and children, environmental factors like urbanisation which has created a substantial change in children’s diet pattern that includes artificially grown foods, refrigerated and frozen ones, canned items and reduced hours of sleep are also related to the development of refractive errors.

![Refraction](chart2)

In India, school eye screening programs are largely carried out by school-teachers trained under NPCB or by the outreach teams of not-profit-eye hospitals. Most schools however do not consider eye screening important enough to formally include as part of their calendar activities. In that case obtaining permissions from the authorities for conducting the program is a major challenge, as they often feel that it interferes with their regular activity. Also absenteeism poses a major setback to cover the entire school in a single visit.

Also children with refractive errors who needs glasses requires cycloplegic refraction and a post mydriatic test before glass prescription. Effect of having a dilated pupil for some time can make children reluctant from getting the examinations done. In certain schools, authorities have rules preventing instillation of any drops in the eye in school premises, forcing the team to refer children to vision care centres for refraction resulting in many drop outs.

Spectacles use among children is a social stigma especially in certain families. They are often seen as a symbol of defective eyes. Creating awareness among the students, parents and community with a clear emphasis on the benefits of spectacle wear would serve the purpose. Teachers role should not only be restricted to vision...
screening but also should extend to monitor and ensure the child gets appropriate management. Sufficient numbers of personnel and adequate infrastructure need to be put in place so that quality spectacles are made available to the needed ones.

Follow up should be made an integral part to gauge compliance. Referral for other ocular conditions should be made. Prescribing glasses for significant refractive errors. Updating of screening protocols periodically to address all aspects of visual impairment. Providing choice of trendy and colourful frames to children. Displaying famous personalities or cartoons wearing spectacles. Interventions to improve compliance of the children.

Of the study population, children with refractive errors were subjected to stepwise ophthalmic examination and were provided with best glasses, free of cost. Records of those children has been filed for the future follow up. Constant usage of spectacles of those children has been filed for the future follow up. Of the study population, children with refractive errors were subjected to stepwise ophthalmic examination and were provided with best glasses, free of cost. Records of those children has been filed for the future follow up. Constant usage of spectacles of those children has been filed for the future follow up.

Of the study population, children with refractive errors were subjected to stepwise ophthalmic examination and were provided with best glasses, free of cost. Records of those children has been filed for the future follow up. Constant usage of spectacles of those children has been filed for the future follow up.

The importance of nutritious diet, adequate rest, involvement in outdoor activities and non-usage of mobile games.

CONCLUSIONS

More near work due to increased educational demands has led to the raise in refractive errors among school children. Greater use of mobile phones and video games serves as an added factor. Awareness programme regarding refractive errors must be conducted for parents, teachers and others. Preventing visual impairment and maintaining eye health since birth through adulthood comes under social priority. Every child must undergo vision screening regularly. Finally, the importance of outdoor activities and wearing spectacles among those with refractive errors and effects of not using them should be explained to children. In addition, children should be taught about the importance of nutritious diet including fresh fruits, greens and vegetables, whole grains and to avoid foods with high content of starches and low content of proteins. Screening eye care programmes targeting school children need enormous knowledge regarding perceptions and awareness of refractive errors among the adults, since the primary decision maker is often not aware of the problem to express his/her discomfort. Training to address ocular problems relating to children should always be a part of residency program in ophthalmology.

REFERENCES